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PDF Datasheet 1654203
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http://www.amp.com/fiberoptics/documents/1654203.pdf

OC-48 Singlemode SFP LC Transceivers

Product Facts

- Complies with OC-48 requirements
- Complies with Small Form-factor Pluggable (SFP) Multi-Source Agreement (MSA)
- High density LC connector interface
- Operates to 12km with singlemode fiber
- Hot Pluggable
- Single +3.3-volt power supply
- PECL and LVPECL AC-coupled data Interface
- Transmitter uses 1300nm FP Laser
- Class 1 Laser Safe per FDA/CDRH and IEC 60825-1
- UL 60950 recognized
- Compatible with standard OC-48 chipsets
- Units are supplied with dust plugs
- Mates to MSA compliant Host Connector and Cage Assembly
- Digital Diagnostics per SFF-8472, Rev. 9.3

Applications

- Switched Backplanes
- Switch to Switch Links
- Switches
- Repeaters
- Network Interface cards

Tyco Electronics, recognizing the market need for higher optical port density, is developing an entire product platform of Tyco Electronics' Small Form-factor Pluggable (SFP) transceivers with the popular LC connector. These transceivers are less than half the width of the functionally similar GBICs and simply plug into a SFP compatible surface mount connector and cage on the customer board. The smaller size and 0.64-inch port-to-port centerline spacing enables equipment manufacturers to cost-effectively double the fiber optic port density of a given product. Tyco Electronics' LC connector footprint is equivalent to the RJ-45 electrical connector and the small size of the LC nose also allows for increased EMI shielding.

Tyco Electronics' SFP LC Transceivers 1511093-X and 1511202-X are 1300nm FP LASER-based fiber optic transceiver modules for use in OC-48 and high-speed proprietary link applications These transceivers send and receive pre-encoded data over a singlemode optical fiber. The modules, which operate from a single +3.3V power supply, contain separate AC-coupled transmitter and receiver sections

that have PECL/LVPECL compatible data interfaces. The transceiver provides diagnostic and alarm features such as temperature, bias, current and output power.

All Tyco Electronics' Singlemode LC SFP Transceivers provide digital diagnostics through an I^2C bus interface based on the SFF-8472, Rev 9.3 Standard. The diagnostics monitor the supply voltage, laser bus connects, temperature, and laser output power. Alarm and warning functionalities are included.

Tyco Electronics also offers a wide variety of Small Form Factor (SFF) and Small Form-factor Pluggable (SFP) transceivers for both single-mode and multimode applications.

Tyco Electronics' SFP OC-48 SFP LC Transceivers have been extensively tested to comply with the OC-48 industry standard. The FP LASER-based transmitter is certified to be Class 1 laser safe, as defined by U.S. and international standards. The modules have been designed with grounding and shielding features that minimize EMI susceptibility and radiated emissions. Units are supplied with dust plugs.

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OC-48 Singlemode SFP LC Transceivers (Continued)

**OC-48 Singlemode
SFP LC Transceivers**

Part Numbers
1511093-1 (w/Push Button Actuator)

1511093-2 (w/Bail Latch)

1511202-1 (w/Push Button Actuator)

1511202-2 (w/Bail Latch)

Note: See chart on page 143 for Part Number difference.

Transmitter Performance Specifications:

(T_C=0 to 70°C, V_{CC}-V_{EE}=3.135 to 3.465V DC)

Parameter	Symbol	Notes	Min	Typ	Max	Units
Operating Data Rate		1	–	–	2.488	Gb/s
Optical Output (avg.) SM	P_{OUT}	1,2	-10	–	-3	dBm
Extinction Ratio	–	3	8.2	–	–	dB
Transmit Disabled Optical Output (avg.)	$P_{OUT\,DIS}$	–	–	–	0	mw
Center Wavelength	λ_{OUT}	4	1260	1310	1350	nm
Spectral Width (RMS)	$\Delta\lambda$	4	–	1	4	nm (RMS)
Relative Intensity Noise*	RIN_{12}	5	–		-132	dB/Hz
Pk-Pk Differential Input Voltage	V_{DIFF}	6	500	–	2000	mV
Transmit Fault Voltage Levels Tx_Fault_On Tx_Fault_Off		7 7	2 0	– –	V_{CC} 0.8	V V
Transmit Disable Voltage Levels Tx Disabled Tx Enabled		– –	1.835 0	– –	V_{CC}+0.2 0.8	V V
Power Supply Voltage	V_{CC} - V_{EE}	–	3.135	3.3	3.465	V
Supply Current	I_{CC}	–	–	100	160	mA
Operating Temperature	T_C	–	0	–	70	°C
TX Disable Assert time	T_Off				10	µs
TX Disable Negate Time	T_On				1	ms
Time to initialize including reset of TX_Fault	T_Init				300	ms
TX_Fault Assert Time	TX_Fault				100	µs
TX_Disable to reset	TX_Reset		10			µs

Note: All optical measurements made through a short patch cable, between 2 and 5 meters in length, using 10µm singlemode fiber unless stated otherwise.

Note: For details on timing requirements of control and status I/O parameters, and module interface and data field descriptions, please refer to the SFP MSA, Appendix B Electrical Interface guidelines.

1. Meets Class 1 laser safety requirements of IEC 60825-1 and IEC 60825-2 and U.S. Department of Health Services 21 CFR 1040.10 and 1040.11 when operated within the specified temperature and power supply ranges.
2. Transmitter optical output power measured per TIA/EIA 455-95. Transmitter modulated with a valid 8b/10b data pattern.
3. Extinction ratio measured per TIA/EIA 526-4A with a repeating K28.7 data pattern.
4. Center wavelength and spectral width measured per TIA/EIA 455-127 using optical spectrum analyzer with a valid 8b/10b data pattern.
5. RIN measured per ANSI X.230-1994 annex A with valid 8b/10b data pattern. RF power meter and current meter test set replaced with microwave spectrum analyzer and calibrated high-speed photoreceiver. Polarization rotator omitted.
6. DJ and TJ measured per OC-48 Standard.
7. Compatible with 10 K, 10 KH and 100 K ECL, PECL and LVPECL.
8. Open Collector/Drain output.
9. Time from rising edge of TX Disable to when the optical output falls below 10% of nominal.
10. Time from falling edge of TX Disable to when the modulated optical output rises above 90% of nominal.

* Measured @ 500 MHz

For drawings, technical data or samples, contact your Tyco Electronics sales engineer, call 1-800-522-6752, or visit our Website at:
http://www.tycoelectronics.com/fiberoptics. Specifications subject to change. Consult Tyco Electronics for latest specifications.

OC-48 Singlemode SFP LC Transceivers (Continued)

**OC-48 Singlemode
SFP LC Transceivers**

Part Numbers
**1511093-1 w/Push Button
Actuator**

1511093-2 w/Bail Latch

**1511202-1 w/Push Button
Actuator**

1511202-2 w/Bail Latch

Receiver Performance Specifications:

(TC=0 to 70°C, V_{CC}-V_{EE}=3.135 to 3.465V DC)

Parameter	Symbol	Notes	Min	Typ	Max	Units
Operating Data Rate	B	1	–	–	2.488	Gb/s
Optical Input Sensitivity	P_{IN}	1	–	–	-18	dBm
Average Receive Power	–	–	–	–	-3	dBm
Optical wavelength SONET/SDH Wavelength window	λ_{IN}	–	1260	–	1360	Nm
Receiver Reflectance	–			See Table Below		
Receiver Loss of Signal Output Voltage	LOS					
Assert	V_A	4	2	2	V_{CC}+ .3	V
Deassert	V_D	4	0	–	0.8	V
Rx LOS Power Levels (avg.)						
Assert	P_A	–	-31	–	–	dBm
Deassert	P_D	–	–	–	-18	dBm
Hysteresis	–	–	0.5	–	–	dB
Power Supply Voltage	$V_{CC} - V_{EE}$	–	3.135	3.3	3.465	V
Supply Current	I_{CC}	–	–	95	115	mA
Operating Temperature	T_C	–	0	–	70	°C
LOS Assert Time	T_Loss_On				100	µs
LOS Deassert Time	T_Loss_Off				100	µs
Serial ID Clock Rate	F_Serial_Clock				100	kHz

Note: All optical measurements made through a short patch cable, between 2 and 5 meters in length, using 10µm singlemode fiber unless stated otherwise.

Note: For details on timing requirements of control and status I/O parameters, and module interface and data field descriptions, please refer to the SFP MSA< Appendix B Electrical Interface guidelines.

1.   Minimum average optical input power (receive sensitivity) at which the BER is less than 10E-10 measured with a 2.488 G Baud Rate 2E7 — 1 NRZ PRBS data pattern.
2.   Per IEEE 802.3Z Gigabit Ethernet Standard.
3.   Return loss measured per TIA/EIA 455-107.
4.   This is an open drain output that should be pulled up with a 4.7K ohm - 10K ohm resistor on the host board. Pull-up voltage level should be between 2.0 V and Vcc + 0.3 V per the SFP MSA.

Receiver Reflectance:

1511093-1, -2	-27 dB
1511202-1, -2	-14 dB

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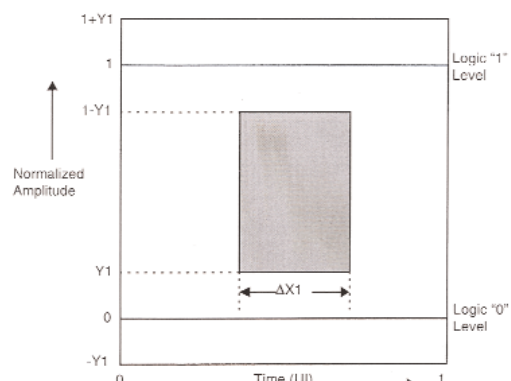
Rate	ΔX1	Y1
OC-48	0.20	0.25

NOTE: Transmitter optical waveform characteristics including rise time, fall time, pulse undershoot, pulse overshoot, and ringing comply with this eye diagram. These characteristics are controlled to help prevent excessive degradation of the receiver sensitivity. The eye mask test is performed using a receiver with a fourth-order Bessel Thompson filter.

Absolute Maximum Ratings:

Parameter	Symbol	Units	Min	Max
Storage Temperature	T_S	°C	-40	85
Data Input Voltage	V_{INPUT}	V	-0.5	V_{CC}
Differential Input Voltage	V_{DIFF}	V	–	2.4
Supply Voltage	V_{CC}-V_{EE}	V	-0.2	5.0

Regulatory Compliance:

Agency	Test Method	Listing Document
FDA	CDRH 21-CFR 1040 Class 1	Accession Number: 9122051-XX
TUV	EN60825-1:1994+A11:1996 EN60825-2:1994+A1 EN60950:1992+A1+A2+A3+A4+A11	TUV Product Services Laser Class I Protection Class III TUV Certificate Number: B020546940001
UL / c**RU**us	UL60950	E208513

ESD Testing:

Test	Test Method	Procedure
ESD1	JEDEC/EIA JESD22-A-114-A (C=100 pF, R=1500 ohm - Human body model)	Pulses applied to each pin and Ground at 1 KV
ESD2	25 KV maximum air discharge (simulates human body discharge into a DUT)	40 discharges are applied per DUT (10 at each of the top, nose, right, and left). Each module is tested with both power ON and OFF

NOTE All products which contain a laser must comply with government regulations for laser safety. In the U.S., the applicable standard is FDA 21 CFR 1040. In other parts of the world, IEC 60825-1 applies. These transceivers were designed and tested to the requirements of the above standards and found to be in compliance with class 1 laser safety limits. When operated within the limits specified in this document, this product conforms to IEC 60825-1: 1993 + A1 : 1997 + A2: 2001, class 1 laser product, requirements.

CAUTION! Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

For drawings, technical data or samples, contact your Tyco Electronics sales engineer, call 1-800-522-6752, or visit our Website at: http://www.tycoelectronics.com/fiberoptics. Specifications subject to change. Consult Tyco Electronics for latest specifications.

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OC-48 Singlemode SFP LC Transceivers (Continued)

Pad Description:

Symbol	Pad #	Function
$V_{EE}T$	1	Signal Ground. Directly connect to ground. [SEE NOTE 1].
Tx_Fault	2	Transmitter Fault. This is an open collector output that should be pulled up with a 4.7K - 10KΩ resistor on the host board. [SEE NOTE 2].
Tx_Disable	3	Transmitter Disable Input. Module disables on high or open. The input is pulled up within the module with a 4.7K - 10KΩ resistor. Its states are: Low (0 - 0.8V) : Transmitter on (>0.8, <2.0V) : Undefined High (2.0 - 3.465V) : Transmitter Disabled Open: Transmitter Disabled.
MOD-DEF2	4	Module Definition 2. This is the data line of two wire serial interface for serial ID. This pad should be pulled up with a 4.7K - 10KΩ resistor on the host board. [SEE NOTE 2].
MOD-DEF1	5	Module Definition 1. This is the clock line of two wire serial interface for serial ID. This pad should be pulled up with a 4.7K - 10KΩ resistor on the host board. [SEE NOTE 2].
MOD-DEF0	6	Module Definition 0. MOD-DEF0 is grounded by the module to indicate that the module is present. The pad should be pulled up with a 4.7K - 10KΩ resistor on the host board. [SEE NOTE 2].
Rate Select	7	This function is not implemented and the pad is floating. Per the SFP MSA, this is an optional input used to control the receiver bandwidth for multiple data rate operation.
LOS	8	Loss of Signal. This is an open collector output that should be pulled up with a 4.7K - 10KΩ resistor on the host board. [SEE NOTE 2]. Normal operation is when LOS is Deasserted. Abnormally low receive signal level is indicated by LOS Asserted.
$V_{EE}R$	9	Signal Ground. Directly connect to ground. [SEE NOTE 1].
$V_{EE}R$	10	Signal Ground. Directly connect to ground. [SEE NOTE 1].
$V_{EE}R$	11	Signal Ground. Directly connect to ground. [SEE NOTE 1].
RD-	12	Received Data Out Bar. Output is internally AC coupled. Use SerDes chip IC manufacturer's termination recommendation to achieve a 50 Ω termination impedance.
RD+	13	Received Data Out. Output is internally AC coupled. Use SerDes chip IC manufacturer's termination recommendation to achieve a 50 Ω termination impedance.
$V_{EE}R$	14	Signal Ground. Directly connect to ground. [SEE NOTE 1].
$V_{CC}R$	15	Receiver Power Supply. Connect as shown in the Recommended Host Board Supply Filtering Network. [SEE NOTE 3].
$V_{CC}T$	16	Transmitter Power Supply. Connect as shown in the Recommended Host Board Supply Filtering Network. [SEE NOTE 3].
$V_{EE}T$	17	Signal Ground. Directly connect to ground. [SEE NOTE 1].
TD+	18	Transmitter Data In. Input is internally AC coupled. There is an internal 100 Ω resistor across TD+ and TD-, which provides a 50 Ω termination for each data input.
TD-	19	Transmitter Data In Bar. Input is internally AC coupled. There is an internal 100 Ω resistor across TD+ and TD-, which provides a 50 Ω termination for each data input.
$V_{EE}T$	20	Signal Ground. Directly connect to ground. [SEE NOTE 1].

NOTE 1: Transmitter and receiver grounds are connected together inside the transceiver module.
NOTE 2: Pull-up voltage between 2.0V and VccT + 0.3V
NOTE 3: VccT and VccR are separate inside the transceiver module.

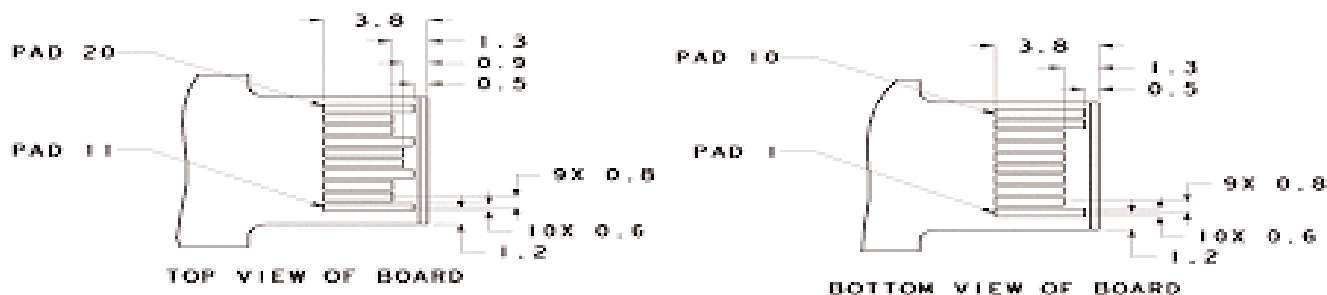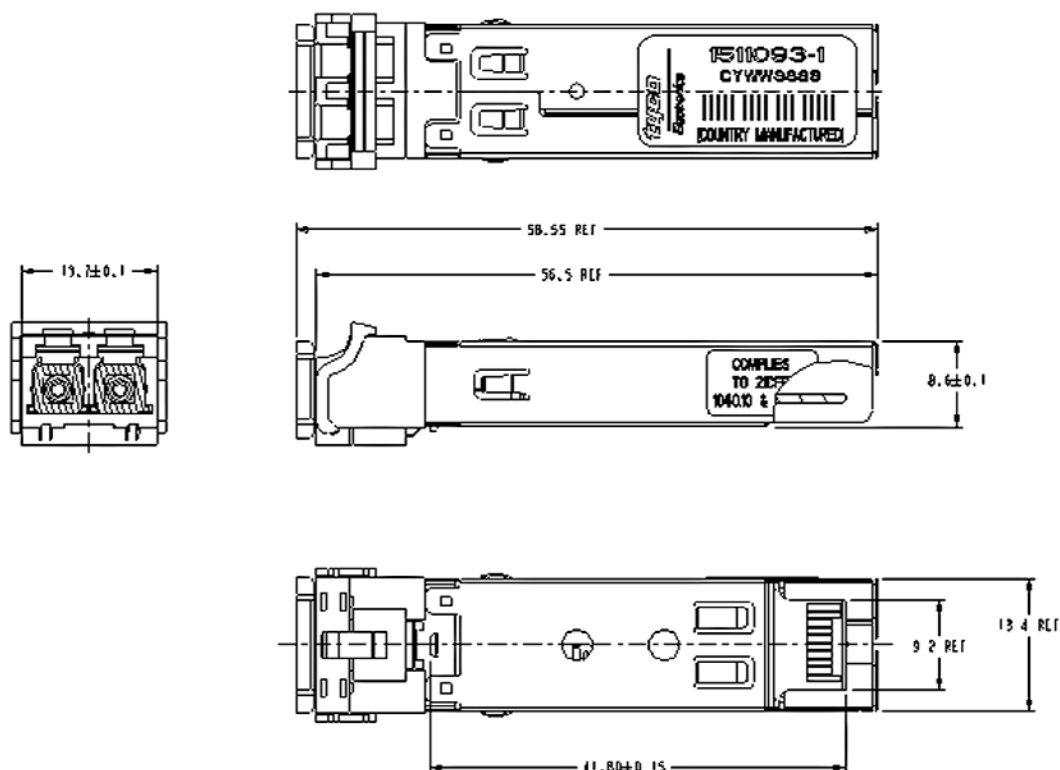**Figure 2: Transceiver Pad Descriptions**
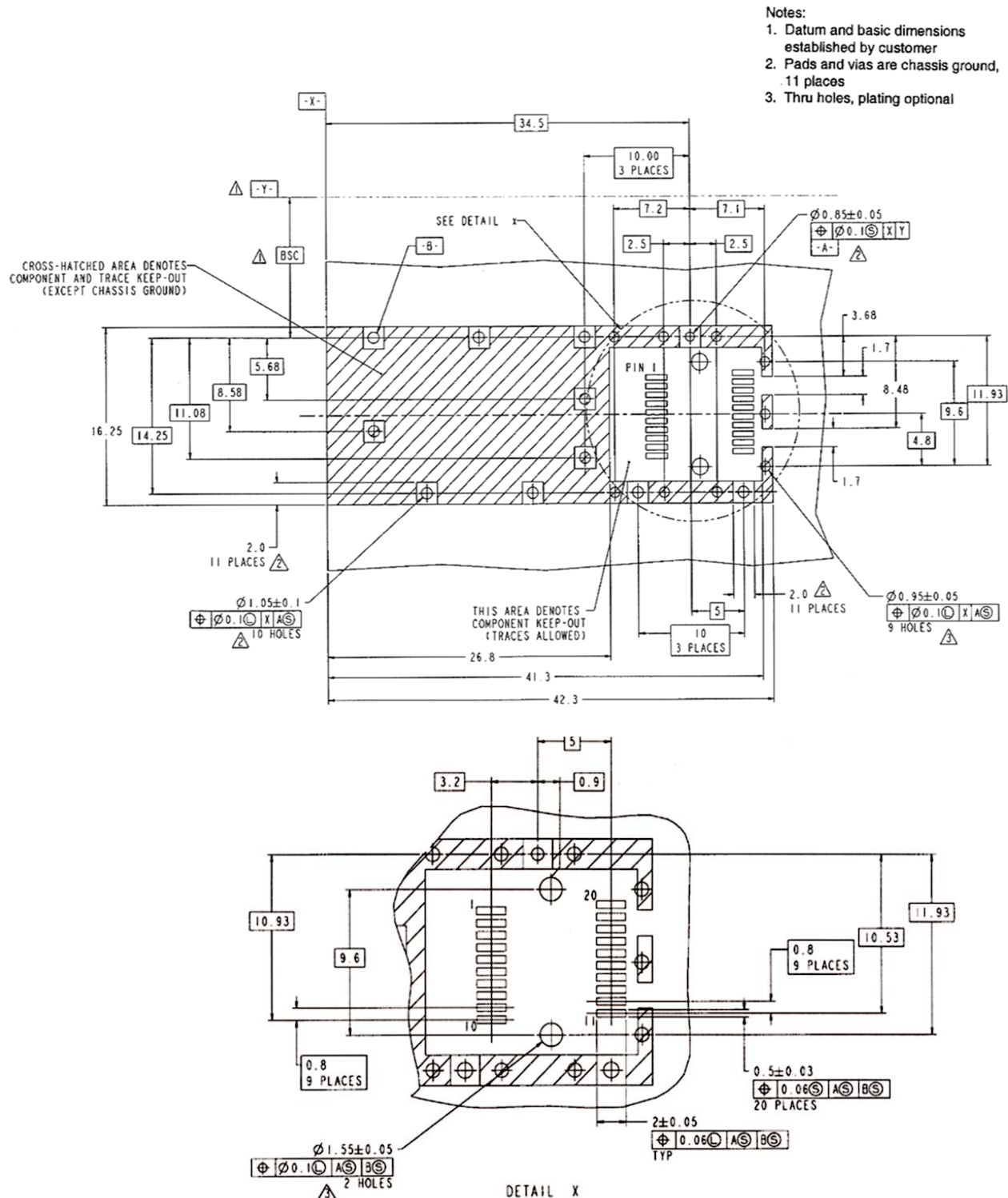

Figure 2: Transceiver Outline Descriptions

Note: All dimensions are in mm.

IMPORTANT: PLEASE REFER TO THE TYCO ELECTRONICS CUSTOMER DRAWING 1511093 & 1511202 FOR TRANSCEIVER HOUSING DIMENSIONS AND TOLERANCES. DRAWINGS CAN BE OBTAINED ON OUR WEBSITE AT: http://www.tycoelectronics.com OR CALL AMPFAX 1-800-522-6752 FOR 24HR FAX SERVICE.

OC-48 Singlemode SFP LC Transceivers (Continued)

Figure 4: SFP MSA Recommended Circuit Board Layout

Notes:
1. Datum and basic dimensions established by customer
2. Pads and vias are chassis ground, 11 places
3. Thru holes, plating optional

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Figure 5: SFP MSA Recommended Bezel Opening
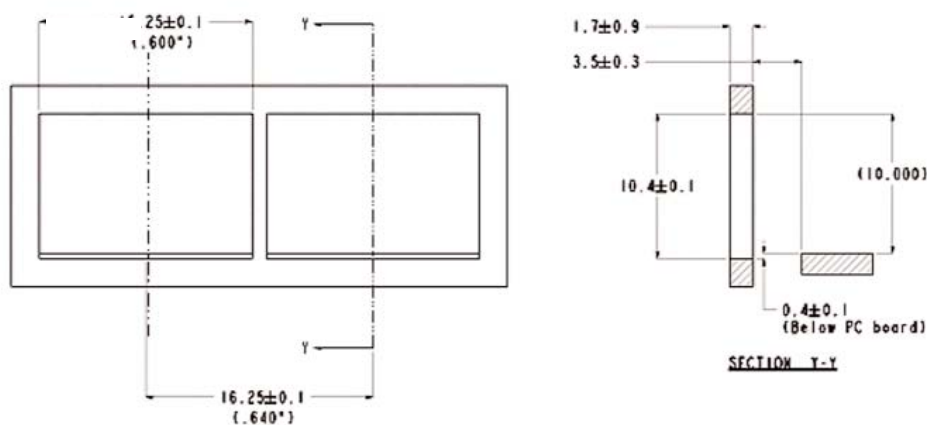
Note: Minimum pitch illustrated. All dimensions are in mm only.

For drawings, technical data or samples, contact your Tyco Electronics sales engineer, call 1-800-522-6752, or visit our Website at:
http://www.tycoelectronics.com/fiberoptics. Specifications subject to change. Consult Tyco Electronics for latest specifications.

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Figure 6: Recommended Termination and Power Supply Filtering
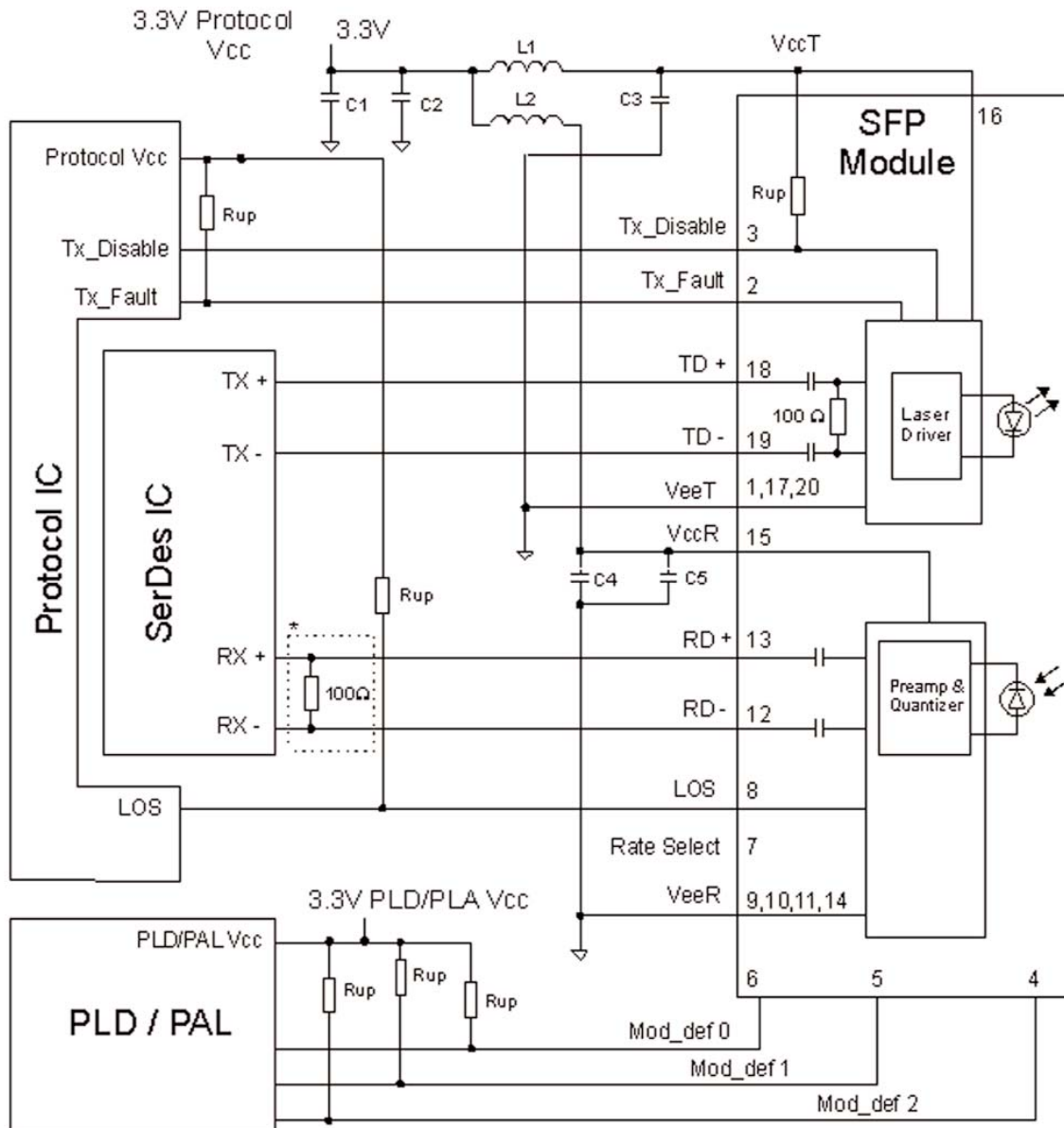
*Use SERDES IC manufacturer's termination recommendation.
C1=C4 = 10 µF
C2=C3=C5 = 0.1 µF
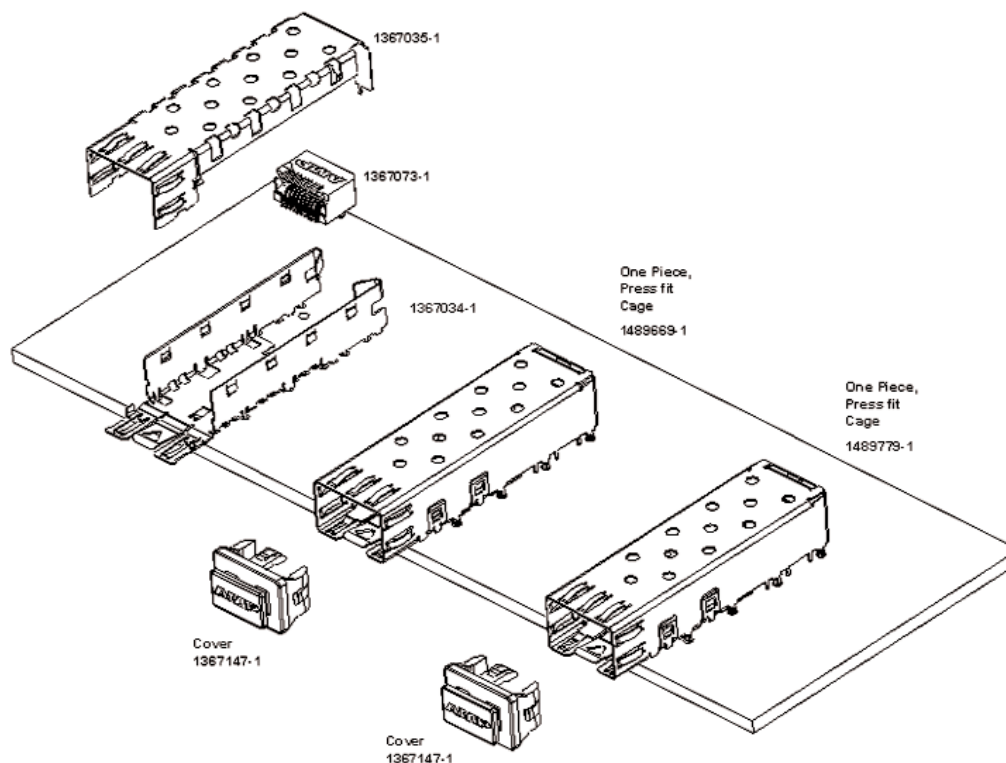   Note: X7R or better MLC types are recommended for all capacitors
L1=L2 = 1 µH .... 4.7 µH, max 1.0 Ω [Ferrite inductors may be used]
Rup = 4.7 KΩ .... 10 KΩ

NOTE: TO IMPROVE EMI, THE SIGNALS TO THE CONNECTOR SHOULD BE SHUT OFF WHEN THE tRANSCEIVER IS REMOVED.

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OC-48 Singlemode SFP LC Transceivers (Continued)

Related Products:

Related Documents:

SFP Connector & Cage Assembly Application Specification 114-13017
OC-48 Singlemode SFP LC Transceiver Application Specification 114-13084

**FOR DETAILED INFORMATION ON ALL TYCO ELECTRONICS FIBER OPTIC TRANSCEIVERS,
VISIT OUR WEB-SITE AT: http://www.amp.com/fiberoptics/electro-optics/transceivers_family.stm**